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ABSTRACT

This paper reports on a study that examined students' self-reported enjoyment level as an indication of student success. A total of 169 subjects who were learning totally via the Internet were chosen from master's students in the School of Library and Information Sciences at the University of North Texas. The following questions were addressed: (1) What is the relationship between learning styles, class participation, and students' enjoyment level in distance learning? (2) If there are relationships between these variables, what is the magnitude of the relationships? (3) What predictors are most important in explaining enjoyment level variance? and (4) Among the three indicators of class participation (pages accessed, pages read, and postings), do some variables explain the dependent variable more than others? The students were asked to complete the Kolb's Learning-Styles Inventory during a face-to-face training session on World Wide Web-based learning. Subjects also reported their performance and enjoyment level of the course near the end of the term. Web Course Tool (WebCT) courseware automatically recorded student participation in terms of pages accessed, pages read, and total postings made. Multiple regression analysis found that learning styles and class participation explain students' enjoyment level. (MES)

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Running head: EFFECTS OF LEARNING STYLE

Effects of learning styles and class participation on students' enjoyment level in distributed learning environments

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Abstract

One hundred and sixty nine subjects, who were learning totally via Internet, were chosen from master's students in the School of Library and Information Sciences at the University of North Texas. The students were asked to complete the Kolb's Learning-Style Inventory during a face-to-face training session on Web-based learning. Subjects also reported their performance and enjoyment level of the course near the end of the term. Web Course Tool (WebCT) courseware automatically recorded student participation in terms of pages accessed, pages read, and total postings made. Multiple regression analysis found that learning styles and class participation explain students' enjoyment level with an effect size of $R^2 = .125$ ($p<0.01$).

Introduction

As the demand for distributed models in higher education grows, more and more courses and programs are delivered over the World Wide Web. However, a web-based learning model is quite different from onsite learning. How does one enhance the possibility of student success? If we can find variables that impact student success, we might be able to design courses according to the students' preferred learning styles to help bridge the gap of not knowing the students as well as in a face-to-face environment.

This study addresses students' self-reported enjoyment level as an indication of student success. Web Course Tool (WebCT) courseware automatically records student participation in terms of total Web pages accessed (hits), total Web pages read (reads) and total postings made (posts) by a student during a semester. In this study, a "hit" refers to an access to an individual course page, either a course tool or a content page. Duplicate accesses count multiple times. A "read" means an individual access to a posting in the mail or discussion areas of a course. A "post" reflects a message composed, either public or private, in the mail or discussion areas of the course.

The following questions will be addressed:

1. What is the relationship between learning styles, class participation and students' enjoyment level in distance learning?
2. If there are relationships between these variables, what is the magnitude of the relationships?

3. What predictors are most important in explaining enjoyment level variance?
4. Among all three indicators of class participation ("hits", "reads" and "posts"), do some variables explain dependent variable better than others?

Literature Review

Learning styles in distance education

Many researchers use the terms "cognitive style and learning style" interchangeably. Ford and Chen defined the term cognitive style as preferred modes of "information processing, while learning style is defined as cognitive styles entailing information processing taking place specifically in a learning context (Ford & Chen, 2001).

The research surrounding learning styles in distance learning is diverse, originating from physical models, cognitive issues, and psychological or emotional aspects of an individual's learning style, etc. (Dunn & Griggs, 2000; James & Gardner, 1995; Linn, 1996; Schellens & Valcke, 2000).

Learning style is defined in this study as "personal qualities that influence a student's ability with peers and the teacher, and otherwise to participate in learning experiences" (Diaz & Cartnal, p. 130).

There is a long tradition of considering learning style as a factor in librarianship education. Stein, Hand, and Totten (1986) found that library educators need to enlarge training in communication theory, to know students' learning styles and to realize that not all people can communicate most effectively in

the same way. Stein and Totten (1983) also suggested library education may benefit from the design of curriculum specifically aimed at identified students' cognitive strengths and weakness. Recently, Nigel Ford (2000) stated the need to focus on the distinction between holists (global learners) and serialists (sequential learners) in learning, and implications for supporting individual users' navigation through virtual information environments.

Instruments used

Four of the most popular learning styles models are the Dunn and Dunn Learning Styles Model, McCarthy's 4 MAT System, Gregoric's Mediation Abilities Model and Kolb's Learning Style Model. Unfortunately, these four approaches have been developed independently of each other - and each with little recognition of the others' work.

INSERT FIGURE 1 ABOUT HERE

One of these learning style inventories used by distance educators is the Kolb Learning- Style Inventory (LSI). Kolb's LSI measures student learning style in two bipolar dimensions of either concrete experiences when learning, or conceptual analyses when accruing skills and knowledge. In general, Kolb's LSI is considered to be a cognitive learning style model, which includes storage and retrieval of information in the brain and represents the learner's way of perceiving, thinking, problem solving, and remembering. Kolb's learning theory (assimilator,

accommodator, diverger, and converger) originates from Jean Piaget's cognitive structure of assimilation, accommodation, equilibration, and interiorization (Hergenhahn, 1997, p.282-285).

Kolb defined learning style on a two-dimensional scale based on how a person perceives and internalizes information. How a person absorbs information is classified as concrete experience or abstract conceptualization; how a person internalizes (processes) information is classified as active experimentation or reflective observation. Kolb paired the two pairs of options into four types of learning styles.

Type I: Diverger (concrete, reflective)- experience is gathered through tangible, felt qualities of immediate experience and is turned to thought by internal reflection on the external world. This type of learner usually asks "Why?'

Type II: Assimilators (abstract, reflective)- can understand information best when it is presented symbolically and conceptually and time is given for internal reflection. This type of learner usually asks "What?"

Type III: Convergers (abstract/active)- understand and perceive information best through concepts and symbols but need the opportunity to work actively (external manipulation) in order to internalize the information. This type of learner usually asks "How?"

Type IV: Accommodators (concrete/active)- gather information best by tangible, felt qualities of immediate experience and need to process information through active

action. This type applies new course material to new situations to solve real problems and usually asks the question "What if ?". (Diaz & Cartnal, 1999). Diaz and Cartnal (1999) suggest that students with less need for concrete experience in learning may be expected to be better suited to the distance format.

Using Kolb's Learning-Style Inventory, Terrell and Dringus (2000) studied the correlation between learning styles and student drop-out rates. They found at the graduate student level the majority of students can succeed in online learning environments regardless of their learning style; however, they found one particular learning style (accommodators) dropped from the programs at rate substantially higher than students with other preferred learning styles.

Simons (2000) found learning style is a factor in training and education and it is a significant factor in the design of training programs and courses. Simons used Kolb's two-dimensional scales (concrete vs. abstract, reflective vs. active) to group the subjects instead of four learning styles. Simons found the reflective observation (RO) learners performed best in the instruction treatment, while active experimentation (AE) learners excelled in the exploration technique. Simons' finding indicates that instruction and exploration training should be used while developing course materials and training programs.

Methodology

This correlational study intends to find relationships between students' self-reporting of enjoyment level, their

learning styles, and class participation in a distance learning environment. The population is all master's level students in the School of Library and Information Sciences at University of North Texas.

One hundred sixty nine graduate students specializing in school librarianship participated in the study during the first and second summer terms, 2001. The subjects are 100% online students. Ninety-five percent of all students participated in the study. The students were asked to complete the LSI in a face-to-face training session on Web-based learning. Subjects also reported their performance and enjoyment level during the course near the end of the term, using a 5 category Likert-scale (1=very enjoyable, 5= very frustrated). Web Course Tool (WebCT) courseware automatically records student participation in terms of total Web pages accessed (hits) , total Web pages read (reads) and total postings made (posts) by a student during a semester.

Analysis of the data was accomplished using the SPSS function of multiple regression analysis. The independent variables are learning style, total number of hits during the semester, total number of readings during the semester, and total number of class postings during the semester. The dependent variable is students' self-reported enjoyment level. In addition to statistical significance, effect sizes will also be reported and interpreted in this study (Thompson, 1988; Wilkinson & APA Force on Statistical Inference, 1999).

Findings

Data screening found missing data were lost at random and they didn't affect the distribution of the sample, so all incomplete cases were removed from the data. The remaining 169 cases from students in two courses in Summer I and Summer 2, 2001 represent over 80 percent of the population.

INSERT TABLE 1 ABOUT HERE

The normally distributed class posting scores were achieved by transforming raw scores into their logarithms. Descriptive statistics and histograms showed all variables were normally distributed and fitted linearity. The standardized predicted value and standardized residual scatterplot also indicated homoscedasticity.

INSERT TABLE 2 ABOUT HERE

The Regression R was 0.354 and it was statistically significant ($p<0.01$, alpha=0.05). The effect size ($R^2=.125$, adjusted $R^2=.104$) indicated a medium relationship between the independent variables and dependent variable (Cohen, 1988, p.80).

INSERT TABLE 3 ABOUT HERE

Learning style was most significant in explaining enjoyment level. It demonstrated a moderate positive relationship (beta weight=0.287, $r_{s\ yhat}=0.734$) with the dependent variable. Class participation, however, showed a negative relationship by beta

weight coefficients. By looking their beta weights, the variable of "reads" and the variable of "hits" demonstrated to be much better in explaining the dependent variable since the variable of "posts" didn't contribute much to the dependent variable. However, the structured coefficients of "posts", "hits", and "reads" were all comparable. That result implies that variable "posts" didn't explain much of the dependent variable, but might correlate with other variables and impact on the dependent variable. This result agrees with our common sense: the more "hits" they have in a Web-based class, the more readings they access and postings they produce.

INSERT TABLE 4 ABOUT HERE

Discussion

In this particular case, we see learning styles and class participation as statistically significant impacts on students' enjoyment level. Class participation, however, has a weak negative impact on enjoyment level. It can be argued that at the graduate level, students tend to study more independently. Thus it may not be most efficient to evaluate student participation by looking at students "hits" in distance-learning classes. However, we need more study to confirm that assumption.

The data supports Stein and Totten's statement that library education may benefit from the design of curriculum specifically aimed at identified students' cognitive style (Stein & Totten, 1986). Therefore, in distance learning environments, it is good

practice for online instructors to incorporate students' learning styles into pedagogical design of their courses to maximize their student's success. The results are also compatible with Simons (2000) and Ford and Chen's (2000) findings of effect of learning style in instructional design.

Because our research participants were chosen from summer school students, they may have different motivation from long semester students and that might impact their performance. It would be valuable to study different student groups in the future to generalize our findings.

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Figure 1. Learning Styles Models

Developer	Theory Basis	Instructional Emphasis
Anthony Gregoric, Katherine Butler: The Mediation Abilities Model	Mediation Ability: The identification and use of four ability channels of concrete sequential thinking, abstract sequential thinking, abstract random thinking, and concrete random thinking	Recognition that teachers as well as students bring individual styles to the instructional setting. Emphasis is on individual awareness of "mediation abilities" and accommodation of these styles in classrooms.
Rita Dunn, Kenneth Dunn, Marie Carbo: The Learning Styles Model	Cognitive Style and Brain Lateralization Theory: A Diagnostic-Prescriptive approach using a framework of 21 specific styles	Identification of key learning styles of each student and matching instruction and learning activities with each student's styles. Learning style elements are identified across five categories: Environmental, Emotional, Sociological, Physiological, and Psychological (Cognitive Processing)
Bernice McCarthy: The 4 MAT System	Brain Lateralization and Cognitive Style Theory used as a basis for identification of individual styles along two continuums - Perception and Processing - result in four major learning styles: Imaginative Learners, Analytical Learners, Common Sense Learners, and Dynamic Learners.	Curriculum and instructional activities are designed to provide instruction for all students across each of the four major learning styles.

David Kolb, Kolb Learning-Style Inventory (LSI).	Considered to be a cognitive learning style mode, which includes storage and retrieval of information in the brain and represents the learner's way of perceiving, thinking, problem solving, and remembering concrete experiences or conceptual analyses	Two-dimensional scale based on how a person perceives and internalizes information. How a person takes in information is classified as concrete experience or abstract conceptualization; how a person internalizes (processes) information is classified as active experimentation or reflective observation.

Note. Table revised from North Carolina Distance Education Partnership, 2001.

Table 1

Descriptive Statistics of different Learning styles
Enjoy Level (1= very enjoyable, 5 = very frustrated)

Learning Styles	Mean	Std. Deviation	N
Diverger	1.85	.69	13
Accomdator	1.87	1.03	37
Converger	1.69	.87	67
Assimilator	2.34	1.25	52

Table 2
Descriptive statistics of regression variables

Source	Enjoyment Level	Learning styles	Hits	Readings	Posts (log)
Mean	1.94	1.94	2402.36	1540.19	1.64
Median	2.00	1.87	2370.00	1463.00	1.64
Skewness	1.04	.63	-.21	.22	.36
Kurtosis	.37	.19	.43	-.55	.07

Note. Learning style is a categorical variable, so represented with mean of dependent variable of each group

Table 3

ANOVA report

Source	Sum of squares	df	Mean square	F	p
Regression	23.41	6	3.90	3.87	.001
Residual	162.25	162	1.01		
Total	186.66		168		

Note. Predictors: (Constant), Learning Styles, Hits, Readings, and Posts; Dependent Variable: Enjoyment Level; Degree of freedom is 6 because learning styles have 4 categories.

Table 4
Coefficients

Model	Unstandardized coefficient B	Std. Error	Standardized coefficient Beta	t	p	r_s
(Constant)	.57	.92		.62	.54	
Learning Style	1.10	.30	.29	3.70	.00	.73
Hits	.00	.00	-.12	-1.19	.24	-.57
Reads	.00	.00	-.16	-1.40	.16	-.56
Posts	.13	.42	.03	.30	.76	-.48

Note. Dependent Variable: Enjoyment Level, r_s = structured coefficient.

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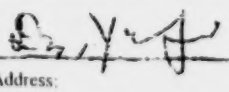
Signature: 	Printed Name/Position/Title: Yunfei Du, Research Fellow	
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